

2010 Pre – Post Gordon Creek Monitoring Report

DRAFT



Before restoration - Photo by Jim Beecher

Southern Wisconsin Chapter of Trout Unlimited

Prepared by

Dave Marshall, Underwater Habitat Investigations LLC

August 2010

Summary

This report summarizes biological, chemical and habitat surveys that were conducted during the spring and summer of 2010 on Gordon Creek between Clay Hill Road and Brue Road. The surveys were designed to characterize the biological integrity of the stream (spring aquatic invertebrate samples and summer fish shocking surveys) and habitat conditions at a Trout Unlimited sponsored restorations site. Chemical conditions and stream flow were also measured periodically at Brue Road and Sandy Rock Road to establish baseline water quality conditions. Onset temperature loggers were deployed upstream at Clay Hill Road, at Sandy Rock Road and at Brue Road to assess long term stream temperatures. A staff gage was installed at Sandy Rock Road to develop a flow rating curve at the site. Water monitoring volunteers and anglers are encouraged to record water levels when sampling or visiting the site and these values can be converted into flow rates once the rating curve is established.

The 2010 surveys demonstrated that Gordon Creek displays very good water quality. Spring aquatic invertebrate samples indicated “excellent” water quality based on the Hilsenhoff Family-level Biotic Index (FBI). The two fish shocking surveys above Sandy Rock Road revealed abundant trout and a fish community that is characteristic of good quality trout streams (Coldwater Index of Biotic Integrity – IBI). The surveys revealed that brown trout numbers exceed 1,000 per mile but the high density has the potential to compromise growth rates and stream ecology. Only two of three temperature loggers were operational by the end of the summer. The logger at Brue Road was damaged. However, water temperatures at Clay Hill Road (maximum 68.1 degrees F) and Sandy Rock Road (maximum 68.8 degrees F) were very favorable during the warm and wet 2010 summer. The combined water chemistry and flow data also revealed that Gordon Creek sustains good water quality; a reflection of improved land uses in recent decades. At the habitat restoration site, box elder trees had shaded banks that were denuded of grass and other vegetation. Over the years, as trees dropped into the water, debris dams provided cover for trout but also exacerbated stream bank erosion problems. Stream banks are expected to heal after the box elder removal. The habitat project is a model for restoration since hydrology and water quality improvements began at the watershed scale and were fine tuned at the stream corridor scale.

Thanks to Mike Schmidt and Jim Gentry for coordinating this project. Thanks to the volunteers (Steve Wald, Tim Steines and Jim Beecher) for assisting with the habitat evaluation survey. Also thanks to Jim Beecher for taking great photographs. Thanks to DNR Fish Biologist Bradd Sims and crew (Dan Rhuoho, Lloyd Meng, Jonathan Hilfer) for conducting the stream electro-shocking surveys.

Methods

Macroinvertebrates were collected with a kick-net. The samples were randomly sorted and identified to the family-level. The Family-level Biotic Index and Family-level EPT (% Ephemeroptera, Plecoptera, Tricoptera or mayflies, stoneflies and caddisflies) were calculated for each site. Fish electro- shocking surveys were conducted on July 1 using two DC gas generated stream shocker-barges. IBI scores, species relative abundance and brown trout size distributions were determined. A semi-quantitative habitat survey was conducted along the restoration site above Sandy Rock Road. This effort involved estimating stream bank erosion rates and collecting cross sectional data. Photosynthetic light intensity and densiometer recordings were used to document box elder shading.

At the Brue Road and Sandy Rock Road sites; flow was measured with a Swoffer Model 2100. A staff gage (in English units) was installed above Sandy Rock Road bridge to establish a flow rating curve. Dissolved oxygen and water temperature were measured with a YSI Model 52. Specific conductivity, pH and temperature were measured with a YSI Model 63. Turbidity was measured with a Hach Model 2100P and transparency was measured with a 120 cm transparency tube. Onset Hobo temperature data loggers were deployed at Brue Road, Sandy Rock Road and Clay Hill Road.

Findings

Aquatic Invertebrates

Macroinvertebrate communities at both sites were very similar and reflected “excellent” water quality based on the family-level biotic index (Figure 1). The macroinvertebrate families are represented in Figure 2 and included environmentally intolerant stoneflies (Plecoptera), mayflies (Ephemeroptera) and caddisflies (Tricoptera).

Figure 1: Family-level Biotic Index Results (< 3.75 = excellent water quality)

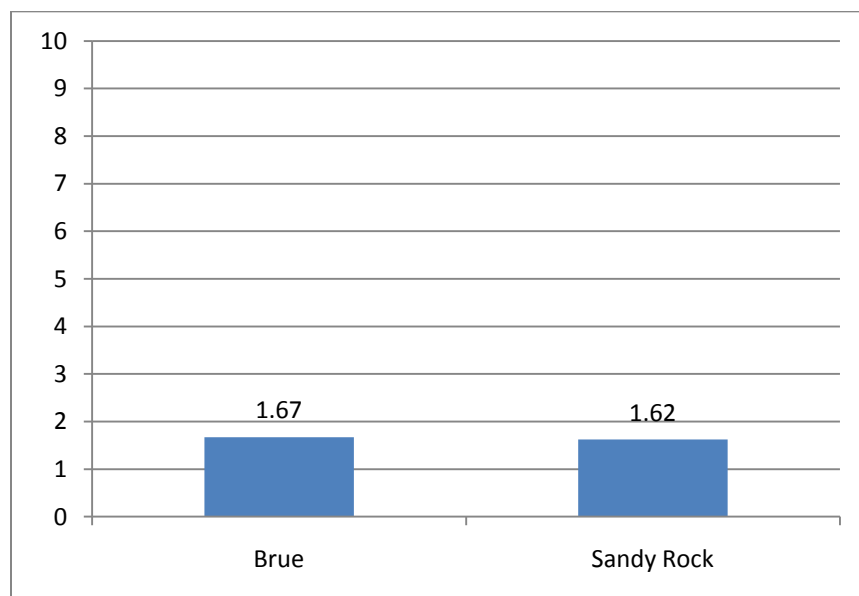
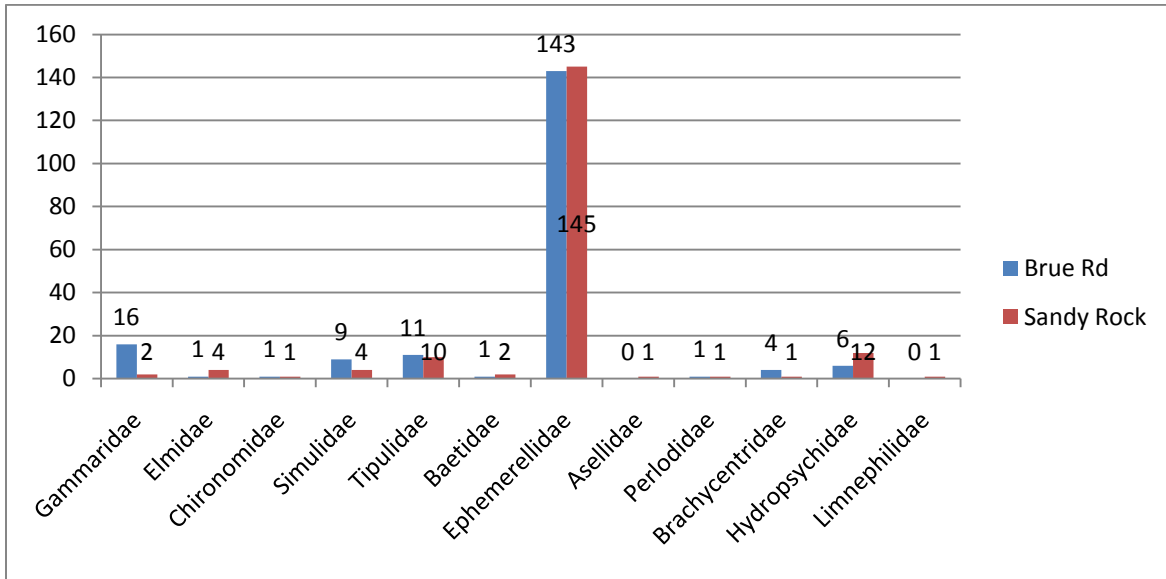


Figure 2: Macroinvertebrate Families



Gammaridae= scuds or side swimmers, Elmidae = riffle beetles, Chironomidae = midges, Simuliidae = black flies, Tipulidae = crane flies, Baetidae = mayflies, Ephemerellidae = mayflies, Asellidae = sowbugs, Perlodidae = stoneflies, Brachycentridae = cased caddisflies, Hydropsychidae = case less caddisflies, and Limnephilidae = cased caddisflies.

Fisheries

We used two towed shocker barges to collect fish along 1625 feet of the Hoerr property and 800 feet along the Kersten property (2010 restoration site) above Sand Rock Road. The following figures demonstrate the findings including coldwater Index of Biotic Integrity (IBI), species composition and size distribution for brown trout, the most numerous species.

Figure3: Coldwater IBI. IBI scores ranging from 60 – 80 indicated good environmental conditions.

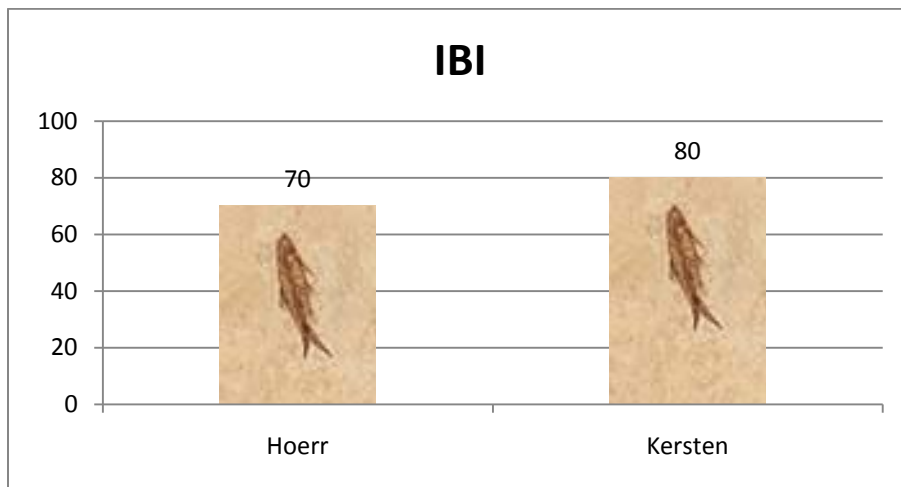


Figure 4: Fish species composition. Brown trout, brook trout, rainbow trout, mottled sculpin, mudminnow, white sucker and American brook lamprey.

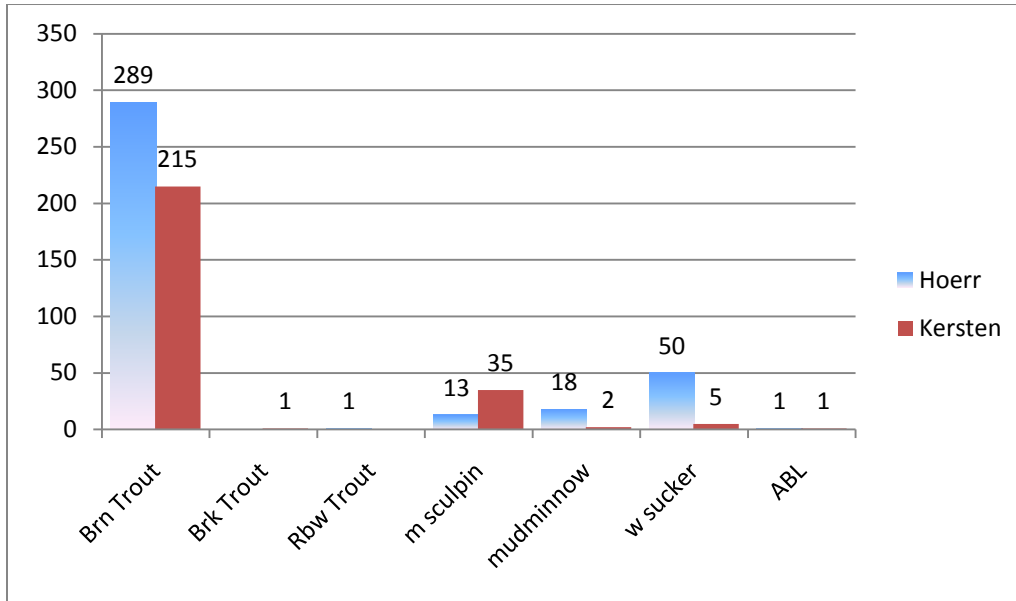
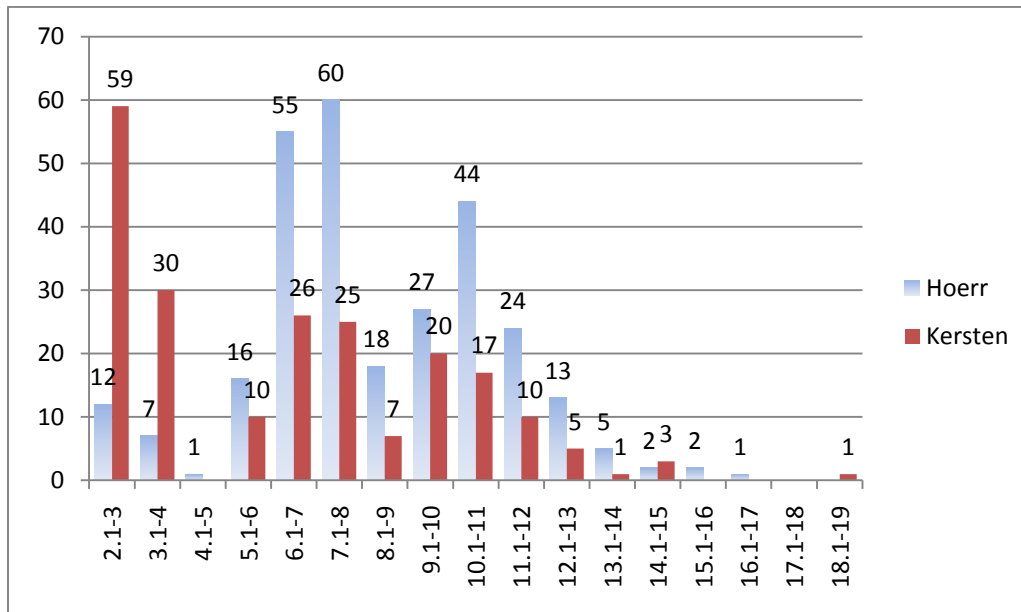


Figure 5: Brown trout size distribution



The surveys revealed that classic trout stream “indicator” nongame fish including mottled sculpin and American brook lamprey were found in very low numbers. Combined with the high density of brown trout (>1,000/mile), the fish community data suggests that brown trout may be over-populated in the stream. This issue warrants further investigation and discussion. The data also revealed an apparent higher trout density along the Kersten property before restoration. While box elder snags and debris dams can provide trout cover, the two stream

reaches cannot be directly compared. Habitat potential along the Kersten property is greater due to higher sinuosity or meandering. The sinuosity index of the Kersten property is greater at 2.78 compared to just 1.73 along the Hoerr property.



Fish shocking along Hoerr property. Photo by Jim Beecher

Habitat Assessment

We collected stream profile information, light, shading and bank erosion estimates along approximately 1700 feet of stream (Table 1) that preceded restoration. Stream cross section data was collected every 100 feet beginning at the south end of the Kersten property. Estimated bank erosion rates ranged from approximately 50% to 80% frequency (Figure 6). The erosion was linked to box elder shading that prevented the stability of grass cover and an entrenched channel that lacked frequent connection to the floodplain. Box elder canopy cover ranged from 30% to 100% shading (Figure 7). As expected, light (measured as photosynthetic wavelengths) was inversely related to shading as light was significantly reduced as shading increased (Figure 7). Profile data from one of 18 transects is displayed to demonstrate channel entrenchment. The space between the red line (channel definition) and green line represents soft sediment deposits, partly associated with erosion and deposition.

Table 1: Survey Sites along the Kersten property prior to habitat restoration

| | Latitude | Longitude |
|-----|-----------------------|-----------------------|
| T1 | 43 degrees 54' 39.54" | 89 degrees 51' 56.16" |
| T2 | 43 degrees 54' 39.78" | 89 degrees 51' 55.2" |
| T3 | 43 degrees 54' 39.5" | 89 degrees 51' 54.9" |
| T4 | 43 degrees 54' 39.63" | 89 degrees 51' 53.69" |
| T5 | 43 degrees 54' 40.74" | 89 degrees 51' 53.69" |
| T6 | 43 degrees 54' 42" | 89 degrees 51' 53.04 |
| T7 | 43 degrees 54' 42" | 89 degrees 51' 52.02" |
| T8 | 43 degrees 54' 43.02" | 89 degrees 51' 51.72" |
| T9 | 43 degrees 54' 43.8" | 89 degrees 51' 52.92" |
| T10 | 43 degrees 54' 43.11" | 89 degrees 51' 52.31" |
| T11 | 43 degrees 54' 43.62" | 89 degrees 51' 55.2" |
| T12 | 43 degrees 54' 44.34" | 89 degrees 51' 54.3" |
| T13 | 43 degrees 54' 44.94" | 89 degrees 51' 53.88" |
| T14 | 43 degrees 54' 45.6" | 89 degrees 51' 52.98" |
| T15 | 43 degrees 54' 45.6" | 89 degrees 51' 50.82" |
| T16 | 43 degrees 54' 45.3" | 89 degrees 51' 52.02" |
| T17 | 43 degrees 54' 47.16" | 89 degrees 51' 53.46" |
| T18 | 43 degrees 54' 46.56" | 89 degrees 51' 53.34" |

Figure 6: Erosion rates along the Kersten property prior to habitat restoration

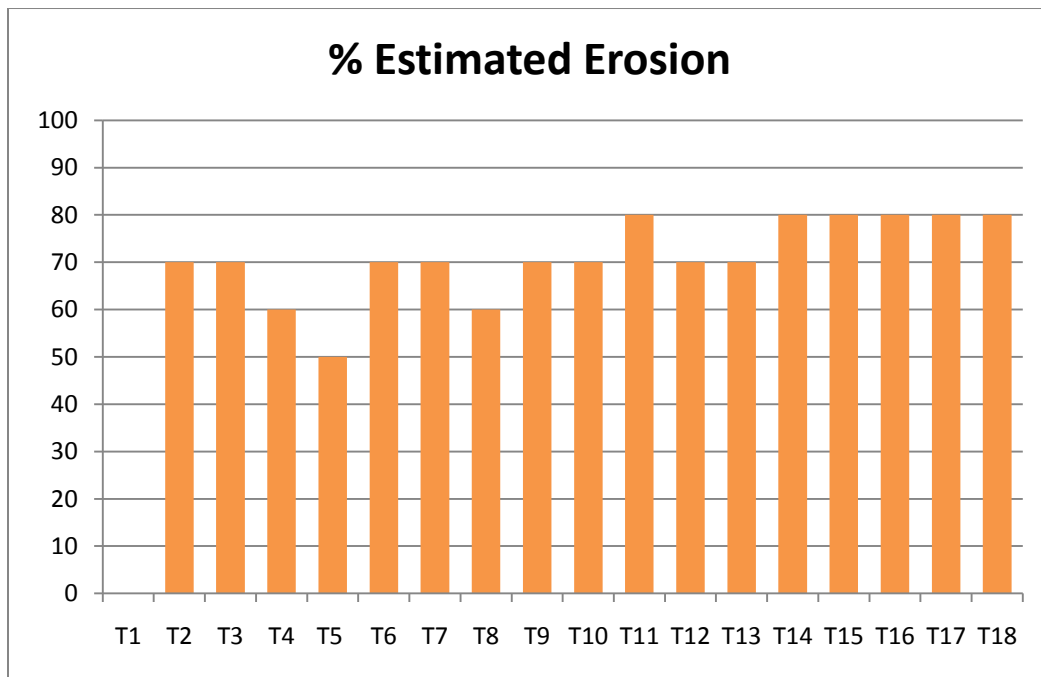


Figure 7: % Open photosynthetic light wavelengths and % overhead canopy demonstrate box elder shading

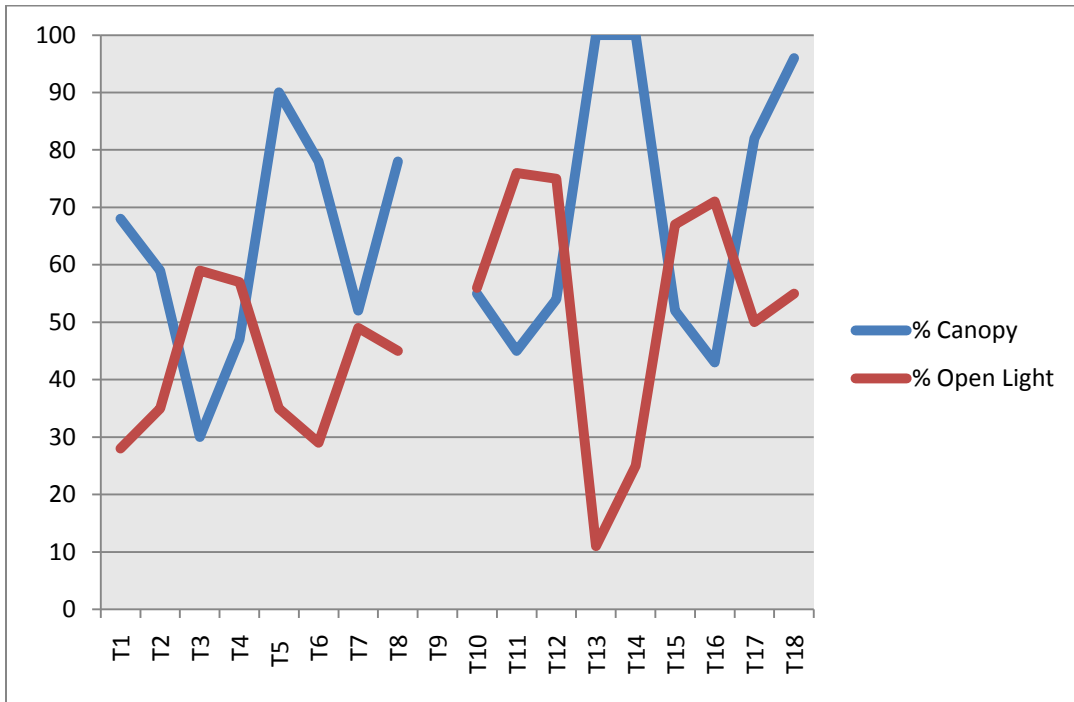
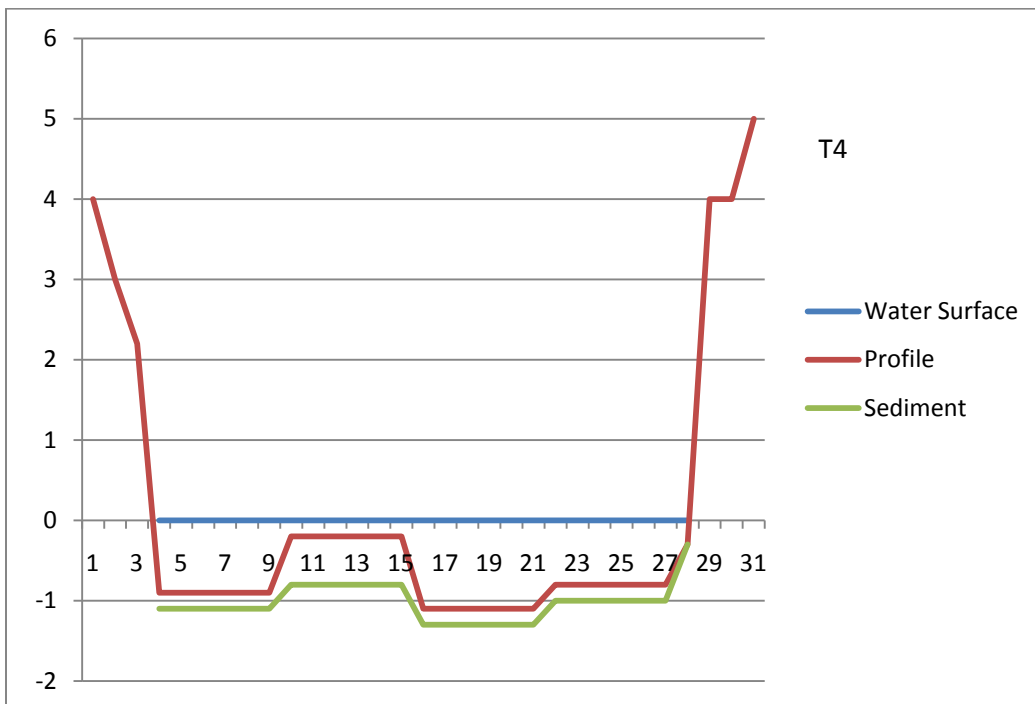


Figure 8: X- section example of entrenched channel along Kersten property before restoration



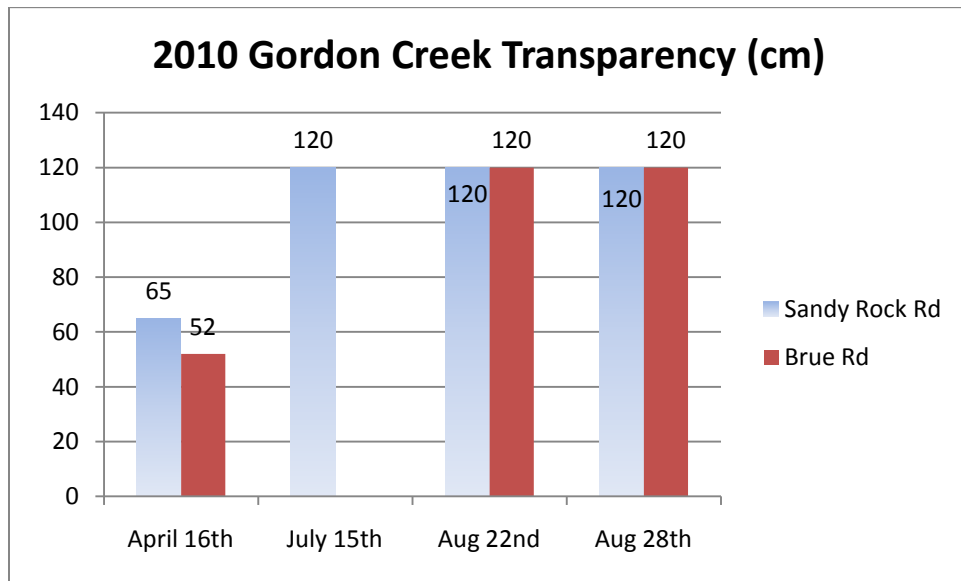


Kersten property habitat survey before restoration. Photo by Jim Beecher

Water Quality Data

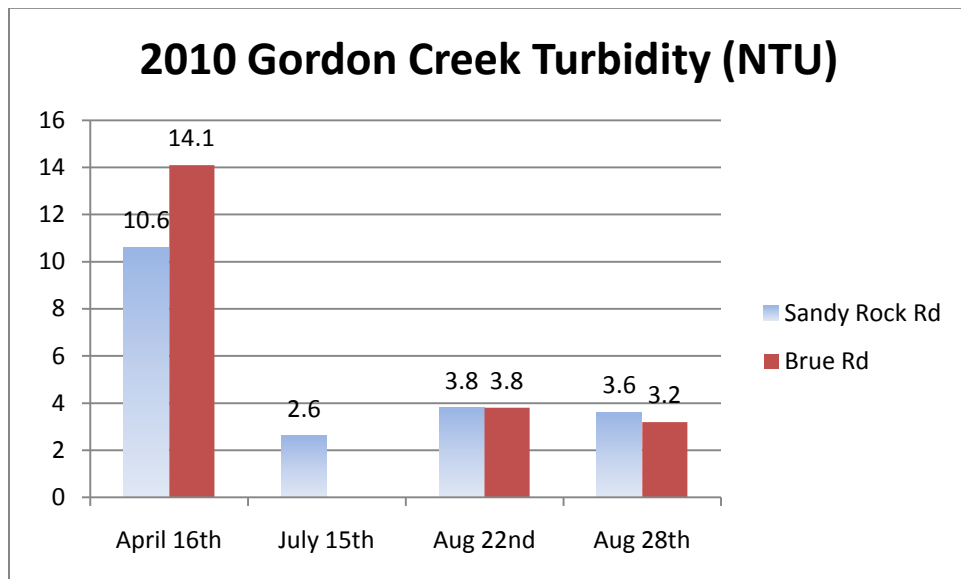
The water quality and flow data presented in figures below reflect favorable conditions for trout and cold water communities. While the data only reflect limited snapshots in time, the favorable measurements are reinforced by healthy biological indicators. The goal of this project is to greatly expand this database over the course of this project.

Figure 9: Gordon Creek Transparency Data



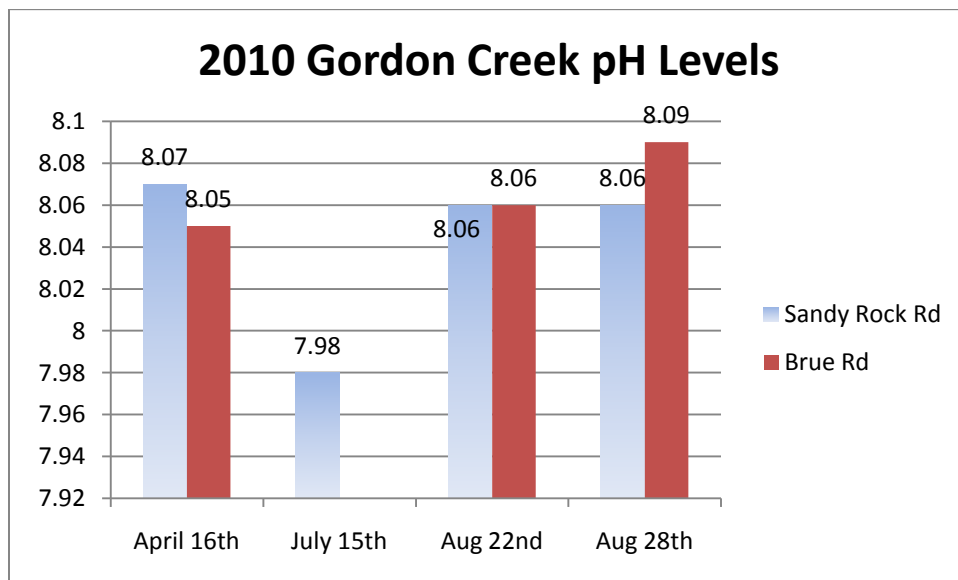
Gordon Creek is a clear trout stream during dry periods.

Figure 10: Gordon Creek Turbidity Levels



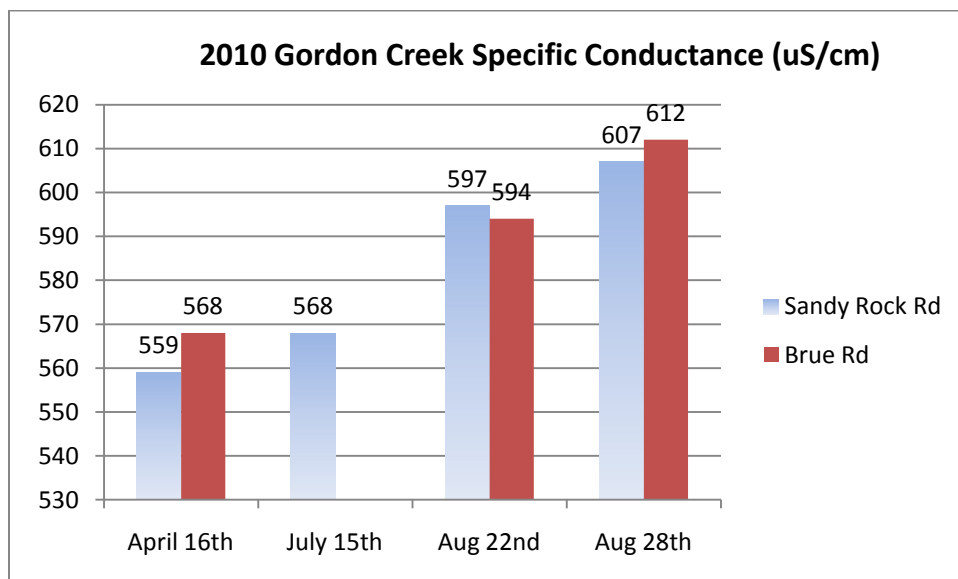
Turbidity measurements also reflect water clarity.

Figure 11: Gordon Creek pH Levels



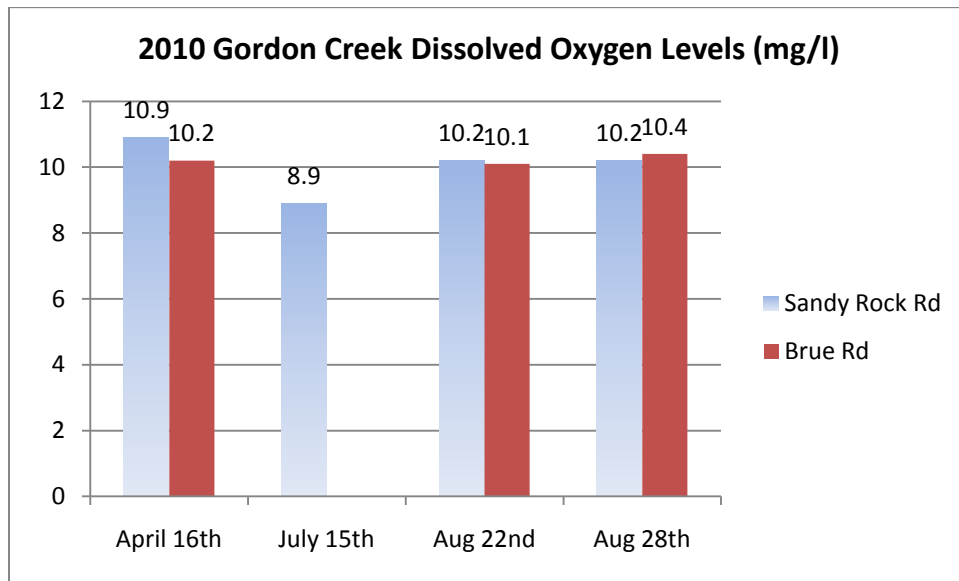
Normal levels that reflect regional geology.

Figure 12: Gordon Creek Specific Conductance



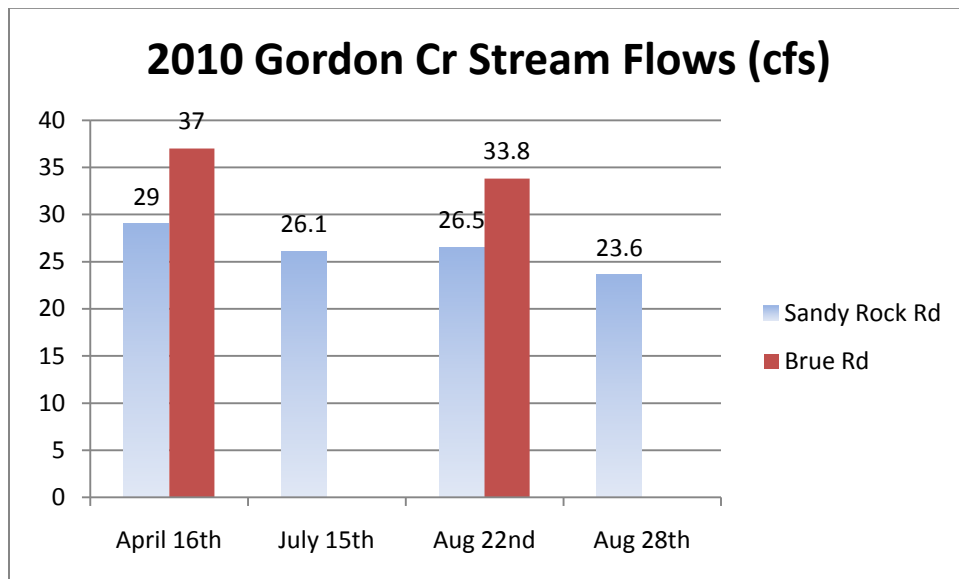
Measure of electrical conductivity in water and indirect measure of dissolved solids. Levels typically drop when precipitation enters a stream.

Figure 13: Gordon Creek Dissolved Oxygen Levels



All measurements were well above minimum criterion.

Figure 14: Gordon Creek Flow Measurements



Flow increases substantially between Sandy Rock Road and Brue Road. At Sandy Rock Road, water level at 1.7' = 26.5 cfs and 1.65' = 23.6 cfs.

Figure 15: Gordon Creek Continuous Water Temperatures at Sandy Rock Road

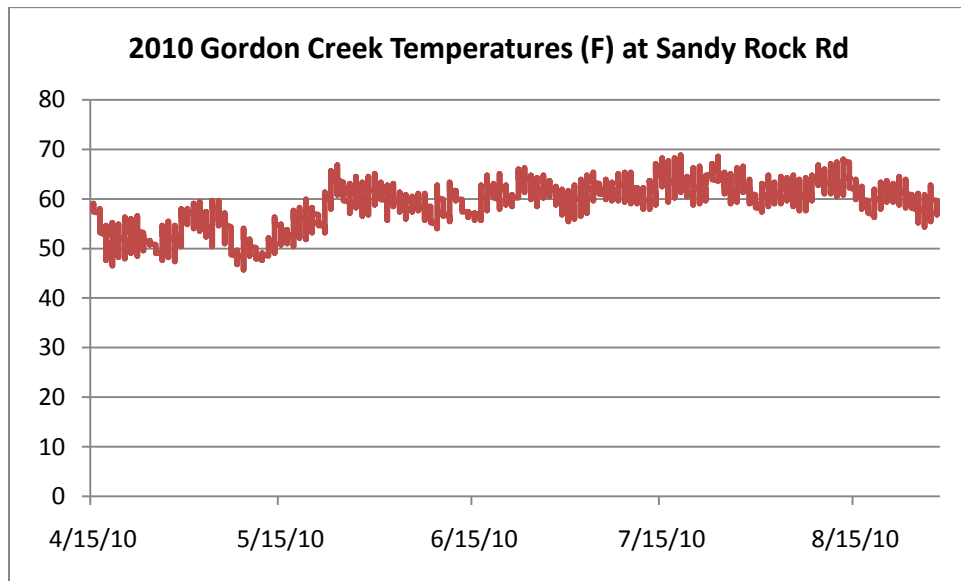
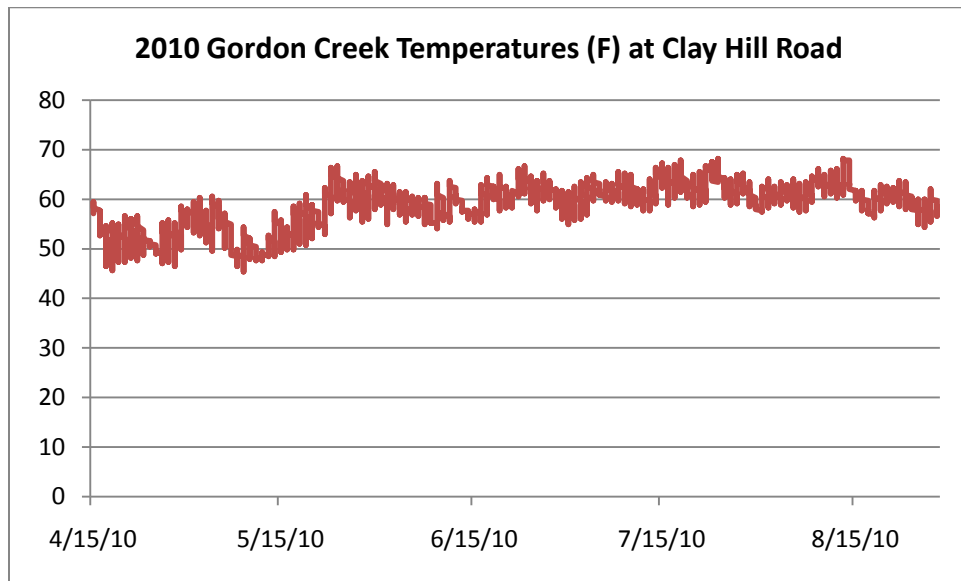


Figure 16: Gordon Creek Continuous Water Temperatures at Clay Hill Road



Health cold trout stream temperatures are sustained in Gordon Creek. Data logger at Brue Road was damaged.

Figure 17: Summary of Gordon Creek Water Temperatures

